Honeywell DPS 88

PRODUCT DESCRIPTION

On October 14, 1982 Honeywell introduced two large scale computer systems, with higher performance than any Honeywell computers have offered to date, as the first members of its new DPS 88 family. The two models are the DPS 88/81 with 16 million bytes of main memory, expandable to 64 megabytes in 16 million increments; and the more powerful DPS 88/82 with main memory expandable to 128 megabytes. The DPS 88/81 is uniprocessor and the DPS 88/82 is dual processor system. Honeywell plans to introduce the three- and four-processor DPS 88 models with corresponding greater power at a later date. Operating under GCOS 8 operating system, the new DPS 88 models are designed to serve as hosts in large, distributed processing networks, as well as to handle traditional batch, remote batch, and interactive workloads. The new DPS 88 family makes use of an advanced evolution of current-mode-logic (CML) technology, high density micropackaging and liquid cooling and advanced, sophisticated system technologies to achieve fast processing speeds, high throughput, and utility-grade availability with low electrical power requirements and small physical size. CML is typically five times faster than conventional transistor-to-transistor (TTL) circuitry. Other new features incorporated in the DPS 88 include the use of 64K-bit MOS memory chips and a 64-kilobyte cache memory. The DPS 88 family also features a store-into-cache policy for improved performance, a five-stage instruction pipeline that permits five instructions to be in process simultaneously; four-way memory interlacing to increase the effective access rate to main memory; native fault testing that can identify logic faults down to the micropackage level, and a system support facility which is a dedicated stand-alone minicomputer that handles all faults, interrupts, test diagnostics and system management. In addition, the DPS

PRODUCT ANNOUNCED: The Honeywell DPS 88 is a family of large-scale computer systems that consists of two models: The DPS 88/81 and the DPS 88/82.

COMPETITION: Amdahl 580 series, IBM 308X series, NAS AS/9000 series, and Sperry Univac 1100/90 series.

DATE ANNOUNCED: October 14, 1982

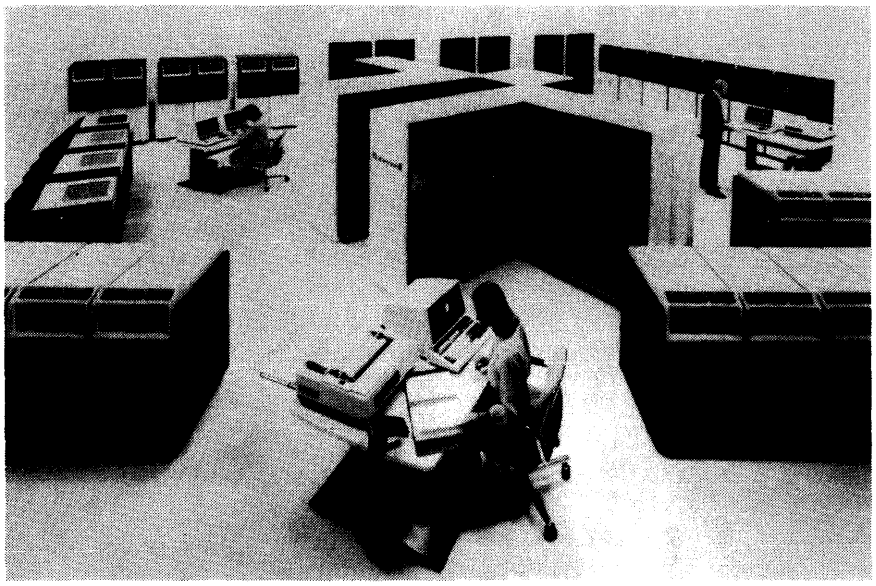
SCHEDULED DELIVERY: Models DPS88/81 and DPS 88/82 will be delivered in the fourth quarter 1983.

BASIC SPECIFICATIONS

MANUFACTURER: Honeywell Information Systems, 200 Smith Street, Walton, Massachusetts 02154. Telephone (617) 895-6000.

CONFIGURATION: The DPS 88 Family consists of two models: the DPS 88/81 and DPS 88/82. The basic DPS 88/81 central system includes a Central Processing Unit (CPU), a Central Interface Unit (CIU), a Main Memory Unit (MMU) with 16 megabytes of main memory, an Input/Output Transfer Unit (IOX) with 62 logical channels, a Channel Adapter Unit (CAU) with 31 channel function slots, a System Support Facility (SSF) and Maintenance Console, a Central System Console, a System Support Unit (SSU), a Thermal Exchange Pump (TEP), and Two Thermal Exchange Air (TEA) units, an option used when a chilled water supply is not available to the TEP. The basic system may be expanded to 64 megabytes of memory in 16 megabyte increments. The IOX may be expanded from 62 to 126 logical channels. An additional CAU with 31 channel function slots may be added and up to five more system consoles may be added to the DPS 88/81. As processing needs increase, the DPS 88/81 can be field upgraded to the DPS 88/82.

The maximum DPS 88/82 consists of two Central Processing Units (CPUs), two Central Interface Units (CIUs), two Main Memory Units (MMUs) with 128 megabytes of main memory, two



The DPS 88/82, Honeywell's new VLS computer, is the company's new top-of-the-line very large scale dual processor computer that can be configured with a maximum of 128 million bytes of main memory and 256 channel function slots. As a networking/communications oriented system, operating within the Honeywell Distributed Systems Environment, the DPS 88/82 can support as many as 320 satellite processors.

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88 offers error correction and detection and automatic system reconfiguration. The DPS 88 modular central system hardware consists of 11 components, and the system architecture allows for gradual expansion to accommodate growth (see basic specifications for more detail). The DPS 88/82 can be expanded to full redundant capability. Scheduled delivery is set for the fourth quarter of 1983 for the DPS 88 although several Beta Sites are scheduled for the second quarter 1983.

RELATIONSHIP TO CURRENT PRODUCT LINE: The DPS 88/81 has from three-and-a-half to four-and-a-half times the processing power of the most powerful single processor system, the DPS 8/70. The new DPS 88/82 is from six to eight times as powerful. The maximum input/output throughput capacity on the new system is 96 million bytes per second, which is about 12 times the throughput of the DPS 8/70. The DPS 88 can support up to 320 satellite processors, over 2,000 time sharing users.

Honeywell provides migration aids for users who move up to the new large scale DPS 88 systems. To Honeywell users of GCOS III, the GCOS 8 operating system offers object-level compatibility, and it supports the full GCOS III job control language. GCOS 8 continues support of Network Processing Supervisor (NPS), General Remote Terminal System (GRTS II), and Distributed Network Supervisor (DNS) communication software that runs on existing Honeywell communications equipment. Programs that have used system privileges will require some adjustments. A special migration tool developed for the DPS 88 is the Common Files Facility, which allows GCOS III and GCOS 8 to share disk files, via a mass storage processor. Level 66 or DPS 8 users can run their current systems simultaneously with the DPS 88 systems and can move the workload to the DPS 88 at a schedule consistent with their needs.

COMPETITIVE POSITION: The Honeywell DPS 88/81 is a large scale single processor system designed to compete with the Amdahl 5860, IBM 3083 Model Group J, National Advanced Systems AS/9050, and Sperry Univac 1100/91. The Honeywell DPS 88/82 is a dual processor system with 16 to 128 megabytes of main memory which is double the capacity of its competitors. The DPS 88/82 will be competing with the Amdahl 5870 and 5880, IBM 3081 Model Group K, National Advanced Systems AS/9070, and Sperry Univac 1100/92.□

Input/Output Transfer Units (IOXs) with 252 logical channels, four Channel Adapter Units (CAUs) with 256 channel function slots, two System Support Facilities (SSFs) and two Maintenance Consoles, twelve System Consoles, two System Support Units (SSUs), two Thermal Exchange Pumps (TEPs), and four Thermal Exchange Air (TEA) units.

CENTRAL PROCESSORS: The DPS 88 Central System hardware consists of 11 components:

- **Central Processing Unit (CPU)**
- **Central Interface Unit (CIU)**
- **Main Memory Unit (MMU)**
- **Input/Output Transfer Unit (IOX)**
- **Channel Adapter Unit (CAU)**
- **System Support Facility (SSF)**
- **System Support Unit (SSU)**
- **Thermal Exchange Pump (TEP)**
- **Thermal Exchange Air (TEA)**
- **Central System Console**
- **Maintenance Console**

All processing is performed by Central Processing Unit, with the Central Interface Unit supervising the Transfer of information between the CPU, the Main Memory Unit and the Input/Output Transfer Unit.

The Input/Output Transfer Unit, coupled with the Channel Adapter Unit, supplies the interface between the network or peripheral subsystems and a Central Interface Unit.

The System Support Facility is a free-standing dedicated maintenance processor with special hardware and software that manages the diagnostic and resource management. The system consoles and maintenance consoles are connected to and controlled by the System Suppoort Facility. System Consoles may also be connected to front-end network processors.

The new architecture employed in the DPS 88 microprogrammed central processor is a five-stage pipeline design. The design increases the system performance by allowing as many as five instructions to be in process simultaneously. The central processor consists of:

- **Two separate high speed cache memories, each providing 32K bytes of storage, the instruction cache (I-cache) and the operand cache (O-cache). The I-cache stores blocks of unmodified instructions and indirect words, while the O-cache stores blocks of operands modified instructions, and modified indirect words. By using cache memory in this manner, the instructions and data are effectively separated, and all store operations are directed to the O-cache, thereby reducing main memory traffic.**
- **An instruction unit that queues instructions and performs a five-step instruction preparation and execution process. Each stage of the pipeline works on its own to decode instructions and generate memory addresses.**
- **Five specialized execution units that are designed to optimize the process by which the system components accomplish a particular function. The central execution unit handles the execution of most of the Transfer Control instructions and other instructions that alter the Processor states, and maintains the address registers and performs housekeeping functions. The basic operations unit performs binary fixed-point operations, Boolean operations, fixed-point comparisons, register loads, and shift operations. The virtual memory and security unit performs most instructions unique to virtual memory management. The binary floating point unit (for multiply and divide) executes fixed-point multiply and divide instructions and all binary floating-point or hexadecimal floating-point instructions. The decimal and character unit executes those instructions involving decimal arithmetic and character manipulation.**

The central interface unit acts as a traffic controller for information passing between the CPU, MMU, and IOX. The central interface unit, as in all other central system components, comes with an independent power supply that helps enhance system availability. The functions performed by central interface unit are:

- **Bringing the central processor to an orderly halt when a critical error is detected.**
- **Supporting communications between central system units through connect, interrupt, and similar steering procedures.**
- **Resolving memory access conflicts between system components.**
- **Directing all accesses to memory by the Central Processing Unit and the Input/Output Transfer Unit.**
- **Switching all control signals, addresses, and data into and out of main memory.**
- **Providing the control tasks for main memory, including error detection and correction (EDAC) to help minimize data errors.**
- **Supporting system startup and restart through reconfiguration tasks.**

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The Input/Output Transfer Unit acting in conjunction with the channel adapter unit handles the data transfers between main memory and communications lines, peripheral devices, and the system support facility, with transfer rates up to 48 million bytes per second. The Input/Output Transfer Unit is designed to:

- Accommodate the Input/Output data transfer demands involved in systems that run numerous programs concurrently (multiprogramming) and that operate more than one processor at a time (multiprocessing).
- Provide the high disk access rates needed in data base oriented systems.
- Serve the heavy transaction processing needs of large organizations.

The CPU does not handle input or output directly; it is responsible for obtaining control segments (portions of a program) that describe the I/O operations to be performed, storing them in a memory mailbox area for the Input/Output Transfer Unit, and issuing a channel connect command to initiate processing the IOX. Once initiated, the IOX and CAU handle the input/output operations independently of central processing. Consequently, by offloading this input/output traffic from the CPU, the IOX helps reduce system overhead and increases the number of actual transactions processed. A basic IOX has 62 logical channels and can be expanded to 126 logical channels.

The Channel Adapter Unit is a sophisticated high speed unit that features a data throughput rate in excess of 20 million bytes per second. The CAU can contain two channel buses (circuit paths over which data is transmitted) for connection to the IOX. The first bus possesses 31 channel function slots, while the second bus provides an additional 33 (using a channel function slot and bus expansion). The function slots are designed for connection to front end processors, peripherals, and System Support Facility. Two channel types are available: the Peripheral Subsystem Interface (PSI) and the Direct Interface (DI). The Peripheral Subsystem Interface (PSI) channels are used to attach mass storage, magnetic tape, and unit record subsystems; the Direct Interface (DI) channels are used to connect FNPs and SSFs. Both channels types allow multiple logical channels to be assigned to one physical channel.

The System Support Facility (SSF) is a small stand-alone computer that logically connects to all central system components. Acting as the system monitor, the SSF checks processing and hardware operation and diagnoses malfunctions online. The SSF functions as the hypervisor with a set of hardware logic and software that supports the central system resource sharing, as well as protection mechanisms between the operating system and the functional test system. On the software side SSF performs the following functions:

- Initializes blocks of memory in the main memory unit for use by the operating system or test software.
- Loads a separate copy of executable processor instructions (hyperswitchers) for each CPU.
- Loads and maintains hyperpage tables in the CPUs and IOXs to control memory isolation for the operating system or test software, and to provide contiguous memory addressing.
- Communicates with the CPU concerning shared processor utilization.
- Initializes CPU information on the input/output channels allocated to the operating system, using configuration information provided by the system administrator.
- Cooperates in system restart following a shutdown.

The System Support Facility (SSF) hardware consists of a mainframe with control panel and peripherals. The mainframe includes a central processing unit, 512K bytes of EDAC-protected MOS memory, and several interface units:

- A mass storage controller, providing microprogrammed support of two removable media drives.
- A multiple-device controller, providing microprocessor control of the SSF flexible disk drive.
- A specialized interface, allowing direct access to DPS 88 system components via a logic interface within the system support unit.
- A multiline communications processor, permitting microprocessor control of system consoles an alternate TAC interconnection path.
- A maintenance interface, supporting the maintenance console, the SSF itself, an optional hardcopy audit trail, and the TAC connection through a customer-supplied modem.

The SSF peripherals include:

- An integrated diskette unit primarily used for saving files, although it can be used as an alternate system initialization device if the mass storage controller is inoperative.
- Two high-speed random-access digital data storage devices, providing main mass storage for the SSF. The storage capacity of each device is 67 megabytes formatted.
- Up to six system consoles can be configured on each SSF.

The System Support Unit (SSU) is attached to the CPU, helps the SSF monitor performance and maintain service. Acting as a liaison between the SSF and all other central system components, the SSU makes possible testing of circuitry, examination of hardware for alarm conditions, and collection of power and cooling information. The SSU provides the power-entry controls for the central system power supply and houses the system clock.

The Thermal Exchange Pump (TEP) circulates liquid coolant to each DPS 88 component that incorporates CML circuitry, and dissipates the heat through four closed cooling loops into the customer's chilled water system. This system allows for lower, more controlled operating temperatures.

If the user cannot provide a chilled water supply, the TEP passes the heat to optional Thermal Exchange Air Units (TEA), which dissipate it into the room air.

The System Consoles are modular free-standing units; models CSU8801 and CSU8802 offer features to help simplify system interaction and increase processing throughput. The CSU8801 model with 15 inch monitor/keyboard can be configured as the second, fourth, and sixth system console per SSF. The CSU 8802 model with 15 inch monitor/keyboard can be configured as the third and fifth system console per SSF. Both system consoles offer the DPS 88 operators the following capabilities:

- Online recall of recent messages.
- Offline retrieval of older messages.
- Optional hardcopy messages.

PERIPHERALS: The DPS 88 supports most peripherals that are used on the DPS 8 system. The following types of peripheral devices can be logically connected to DPS 88:

- Front-end Network Processors
- Terminals
- Peripheral Processors
- Disk and Tape units
- Card readers and Punches
- Online and Offline Printers

DPS 88 Peripheral subsystems communicate with the central system through the channel adapter unit and input/output transfer unit. FNPs connect to the CAU directly via individual channels. Mass storage, tape, and unit record devices are linked to the channel adapter by way of peripheral processors. Up to two interfaces (buses) connect each CAU with the IOX for access from peripheral subsystems. Each CAU can transfer data at a rate of more than 20 million bytes per second.

SOFTWARE: GCOS 8 was introduced in 1979 as the operating system for the DPS 8. The new DPS 88 will operate only under GCOS 8. The new version of the operating system can manage larger real memories (up to 128 million bytes), larger program sizes (up to 1020K bytes), more files per job (up to 240, including system files), up

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to eight input/output queues per process, greater transaction throughput and enhanced sysout. The current database offerings will be extended with a relational access manager that allows a relational form of inquire to DM-IV I-D-S/II and Unified File Access System (UFAS) databases. The relational access manager will be used by new user friendly inquiry facilities available for both nontechnical end users and application programs. Still another feature of this operating system will be a software disk cache buffer option that reduces disk I/O by using a site-controllable portion of main memory as a cache.

The new GCOS 8 will extend Honeywell's distributed processing capabilities by providing DM-IV transaction processor enhancements to facilitate cooperating Transaction Processing. This new Transaction Processor enhancement allows an end-user at one system in a network to generate transactions that physically execute and access databases on other hosts or satellites within the network.

PRICING: A basic DPS 88/81 central system includes a central processing unit, a central interface unit, a 16 million-byte main memory unit, an input/output transfer unit, a channel adapter unit, 31 channel function slots, a system support facility, a system console/table/pod, a maintenance console, a system support unit, and a thermal exchange pump. This basic central system has a purchase price of $2,850,000. On a four year agreement, the monthly lease is $91,200.

A basic DPS 88/82 central system includes the same components as DPS 88/81, as well as two central processing units, two system support units, and two thermal exchange pumps. This basic central system has a purchase price of $4,050,000 and a monthly lease of $141,100 on a four-year agreement.

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	1-Year Lease	4-Year Lease	SPSS
PROCESSORS						
CPS8884	DPS 88/81 Central Processor System with 16MB Memory	2,850,000	5,950	116,500	91,200	1,290
CPS8885	DPS 88/82 Central Processor System with 16MB Memory	4,050,000	7,050	179,500	141,100	1,870
PROCESSOR OPTIONS						
CPK8884	Central System Upgrade CPS8884 to CPS8885	1,200,000	1,100	63,000	49,900	580
MXC8800	Additional CIU and MMU for CPS8885 (no memory included)	300,000	500	12,000	10,000	—
CMM8816	Additional 16MB Memory Module	400,000	650	13,900	11,100	—
MXU8800	Additional IOX with 62 Logical Channels and CAU with 31 Channel Function Slots (for CPS8885 only)	250,000	500	10,000	8,100	—
MXF8804	IOX Logical Channel Expansion (62 to 126). Max. of one per IOX	6,000	NC	240	200	—
MXF8800	Additional CAU with 31 Channel Function Slots (max. of 1 per IOX)	150,000	150	5,400	4,300	—
MXF8810	CAU expansion from 31 to 64 Channel Function Slots	100,000	95	4,000	3,300	—
CPF8802	Additional System Support Facility (SSF). For CPS8885 only. Includes system console with large screen monitor interface, 15" CRT and Keyboard, and Console Table and Control Pod, Maintenance Console, 12" CRT and Keyboard, and Pedestal	75,000	150	3,000	2,500	—
	Consoles and Features					
CSU8801	Additional System Console with 15" CRT and Keyboard for 2nd, 4th, and 6th System Console per SSF	3,640	103	130	110	—
CSU8802	Additional System Console with 15" CRT and Keyboard for 3rd and 5th System Console per SSF	4,640	36	166	140	—
CSF8803	Large Screen Monitor Interface Feature for CSU8801/8802/ Factory installed only.	400	NC	16	13	—
CSF8804	System Console Table (No control pod) for CSU8801/8802	550	NC	NA	NA	—
CSF8801	120 cps Printer for System Console	3,390	50	121	103	—
CSF8802	120 cps Printer for Maintenance Console	2,950	33	105	90	—
CSF8805	23" Large Screen Monitor	2,358	16	157	135	—
CSF8806	Ceiling Mount for CSF8805	195	NC	NA	NA	—
	Power and Cooling					
PSS8800	Memory System UPS Feature	3,800	3	150	125	—
MGS8801	Motor Generator and Control, 3 Sec. Ride-Through, 62.5KVA, 60Hz, 208/240 or 440/480 VAC Input	38,000	70	1,280	1,025	—
MGF8801	Power Sequencer for use with MG	4,000	2	135	110	—
MGF8802	Power Sequencer for use with Full System UPS	4,000	2	135	110	—
CPF8801	Thermal Exchange Air Unit. One option required for each TEP when customer cannot provide chilled water source for TEP.	30,000	50	1,200	1,000	
	Peripheral and Network Processors Attachment Features*					
MXF8801	Exchange of Disk or Tape Processor Attachment Feature (DPS 88 Systems only)	2,500	NC	NA	NA	—
MXF8802	Exchange of Unit Record Processor Attachment Feature (DPS 88 Systems only)	2,500	NC	NA	NA	—
MXF8803	Exchange of Network Processor Attachment Feature (DPS 88 Systems only)	1,500	NC	NA	NA	—

*For use with previously installed peripheral processors which are being attached to a DPS 88 system. These features are not needed when ordering new peripheral processors for a DPS 88 system. ■